08:10:27 OCA PAD AMENDMENT - PROJECT HEADER INFORMATION 12/12/89

Active

Project #: G-33-671 Cost share #: G-33-341 Rev #: 1
Center # : 10/24-6-R6850-0A0 Center shr #: 10/22-1-F6850-0A1 OCA file #:
Work type : RES
Contract#: CHE 8951927 Mod #: ADMIN. Document : GRANT
Prime #: Contract entity: GTRC

Subprojects ? : N
Main project #:

Project unit: CHEM Unit code: 02.010.136
Project director(s):
BOTTOMLEY L A CHEM (404)894-4014

Sponsor/division names: NATL SCIENCE FOUNDATION / GENERAL
Sponsor/division codes: 107 / 000

Award period: 891115 to 910430 (performance) 910730 (reports)

Sponsor amount	New this change	Total to date
Contract value	0.00	94,573.00
Funded	0.00	94,573.00
Cost sharing amount		94,573.00

Does subcontracting plan apply ?: N

Title: ANALYTICAL CHEMISTRY FOR ENGINEERS

PROJECT ADMINISTRATION DATA

OCA contact: David B. Bridges 894-4820

Sponsor technical contact

JOSEPH REED
(202)357-7499
NATIONAL SCIENCE FOUNDATION
1800 G STREET, N.W.
WASHINGTON, D.C. 20550

Sponsor issuing office

MARIAN SCHEINER
(202)357-9653

(SAME)

Security class (U,C,S,TS) : U
Defense priority rating : N/A
Equipment title vests with: Sponsor

ONR resident rep. is ACO (Y/N): N
NSF supplemental sheet
GIT X

Administrative comments -
PER D. WELCH MEMO OF 12/4/89, COST SHARING ACCOUNT NO. CHANGED FROM G-33-341 (F6850-0A0) TO G-33-341 (F6850-0A1) FOR SPECIAL INITIATIVE FUNDING.

SR 406

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION

NOTICE OF PROJECT CLOSEOUT

Closeout Notice Date 02/26/92

Project No. G-33-671 Center No. 10/24-6-R6850-0A0

Project Director BOTTOMLEY L A School/Lab CHEMISTRY

Sponsor NATL SCIENCE FOUNDATION/GENERAL

Contract/Grant No. CHE 8951927 Contract Entity GTRC

Prime Contract No.

Title ANALYTICAL CHEMISTRY FOR ENGINEERS

Effective Completion Date 910430 (Performance) 910730 (Reports)

Closeout Actions Required:	Y/N	Date Submitted
Final Invoice or Copy of Final Invoice	N	
Final Report of Inventions and/or Subcontracts	N	
Government Property Inventory & Related Certificate	N	
Classified Material Certificate	N	
Release and Assignment	N	
Other	N	

CommentsBILLING VIA LINE OF CREDIT. 98A SATISFIES "PATENT" REPORTING.

Subproject Under Main Project No.

Continues Project No.

Distribution Required:

Project Director	Y
Administrative Network Representative	Y
GTRI Accounting/Grants and Contracts	Y
Procurement/Supply Services	Y
Research Property Managment	Y
Research Security Services	N
Reports Coordinator (OCA)	Y
GTRC	Y
Project File	Y
Other	N
	N

G-33-671

OMB Number 345-0058

NATIONAL SCIENCE FOUNDATION
1800 G STREET, NW
WASHINGTON, DC 20550

BULK RATE
POSTAGE & FEES PAID
National Science Foundation
Permit No. G-69

PI/PD Name and Address

Lawrence A. Bottomley
Sch of Chemistry
Georgia Tech Research Corp
Atlanta GA 30332

NATIONAL SCIENCE FOUNDATION
FINAL PROJECT REPORT

PART I - PROJECT IDENTIFICATION INFORMATION

1. Program Official/Org. Joseph Reed - CHE

2. Program Name CHEMICAL INSTRUMENTATION PROGRAM

3. Award Dates (MM/YY) From: 11/89 To: 04/91

4. Institution and Address
Georgia Tech Research Corp
Administration Building
Atlanta GA 30332

5. Award Number 8951927

6. Project Title
Analytical Chemistry for Engineers

This Packet Contains
NSF Form 98A
And 1 Return Envelope

NSF Grant Conditions (Article 17, GC-1, and Article 9, FDP-II) require submission of a Final Project Report (NSF Form 98A) to the NSF program officer no later than 90 days after the expiration of the award. Final Project Reports for expired awards must be received before new awards can be made (NSF Grants Policy Manual Section 677).

Below, or on a separate page, provide a summary of the completed projects and technical information and attach it to this form. Be sure to include your name and award number on each separate page. See below for more instructions.

PART II - SUMMARY OF COMPLETED PROJECT (for public use)

The summary (about 200 words) must be self-contained and intelligible to a scientifically literate reader. Without restating the project title, it should begin with a topic sentence starting the project's major thesis. The summary should include, if pertinent to the project being described, the following items:

- **The primary objectives and scope of the project**
- **The techniques or approaches used only to the degree necessary for comprehension**
- **The findings and implications stated as concisely and informatively as possible**

PART III - TECHNICAL INFORMATION (for program management use)

List references to publications resulting from this award and briefly describe primary data, samples, physical collections, inventions, software, etc. created or gathered in the course of the research and, if appropriate, how they are being made available to the research community.

C	2-1-92
Principal Investigator/Project Director Signature	Date

IMPORTANT:
MAILING INSTRUCTIONS
Return this *entire* packet plus all attachments in the envelope attached to the back of this form. Please copy the information from Part I, Block I to the *Attention line* on the envelope.

PART II - SUMMARY OF COMPLETED PROJECT

Analytical Chemistry for Engineers CHE 8951927 (NSF-ILI)

L. A. Bottomley, P.I.; Period: 11/1989 - 10/1991; Amount: $ 94,573

A novel approach for educating engineering students in the essentials of analytical chemistry has been developed by the analytical faculty at Georgia Tech. The course *Instrumental Analysis for Engineers* (CHEM 3281) approaches analytical chemistry from a global viewpoint, emphasizing the general aspects of analysis: sampling, separations, data acquisition and interpretation. Via a combined laboratory/lecture approach, engineering students are provided with a sufficient understanding of the fundamental concepts of chemical analysis (sensitivity, selectivity, limit-of-detection, etc.) so that they may communicate effectively with analytical chemists and properly interpret analytical data presented to them. The laboratory portion of this course currently has research grade chromatographic, mass spectrometric, spectroscopic and flow injection analysis equipment to illustrate the concepts of analytical techniques and methodology described in lecture. This equipment enables students in gaining hands-on experience in the separation and identification of complex mixtures, in the assessment of appropriate sampling strategies and in the evaluation of the precision and accuracy in analytical measurements. This course is a core requirement for students pursuing a bachelor's degree in Chemical Engineering. This course is offered two quarters a year with a typical enrollment of 48 students per quarter.

PART III - TECHNICAL INFORMATION

An itemized listing of the equipment purchased for this laboratory with grant funds (including the Institute's matching funds contribution) are given below.

- Three Varian Model 3300 Gas Chromatographic Systems with dual flame ionization and electron capture detectors. Each of the gas chromatographs are interfaced to a Zenith Model 2CV computer system (80286 cpu). Data acquisition is controlled by Varian's STAR integrator software package.

- Three Varian Model SpectrAA 10 Atomic Absorption Spectrometer Systems

- Three Varian Model 9010 Liquid Chromatographic Systems with Model 9050 variable wavelength UV-Vis detection. Each of the gas chromatographs are interfaced to a Zenith Model 2CV computer system. Data acquisition is controlled by Varian's STAR integrator software package.

- Three Shimadzu Model 160U UV-Visible Spectrophotometers

- One Hewlett-Packard Model 5890 Capillary Gas Chromatograph equipped with a Model 5971A Mass Selective Detector

Experiments developed for this course and utilizing the equipment listed above include:

1) *Sampling of Heterogeneous Mixtures.* Ternary mixtures of Zn, Cr and Co nitrate are given to each student. The percent composition (by weight) is determined following quantitative dissolution of precisely weighed samples in deionized water. The concentration of each component in this solution is determined by application of Beer's law for simultaneous determination of multicomponent mixtures.

2) *Detector Sensitivity and Selectivity in Gas-Liquid Chromatography.* Complex mixtures of substituted chlorobenzene and chlorophenol naphthalene derivatives are separated on

a wide-bore capillary column. The individual components are identified by comparison of the observed retention times with those of standard reference samples. Observed responses from both the electron capture and flame ionization detectors permit the assessment of detector sensitivity and selectivity.

3) *Analysis of the Metal Composition of Fruit Juices.* Commercial fruit juice preparations are analyzed for their Fe, Zn, Cu, Mn and Co composition by atomic absorption spectrometry employing standard addition methods.

4) *Flow Injection Analysis of Soil Components.* The total nitrogen composition of locally obtained soil samples are determined by flow injection analysis using colorimetric detection and quantitation by standard series.

5) *Quantitative Determination of Sweeteners in Carbonated Beverages.* The identity and quantity of artificial sweeteners in carbonated beverages are determined by high performance liquid chromatography.

6) *Evaluation of the Efficiency of Extractions by Atomic Absorption Spectroscopy.* The extraction of copper from aqueous solution into toluene with oxime is performed as a function of the pH. The concentration in both the aqueous and organic phases are determined by atomic absorption spectroscopy. From this data, distribution ratios are determined.

7) *Quantitative Analysis of Solvent Mixtures by Analytical Infrared Spectroscopy.* The composition of a three-component mixture is identified by infrared spectrometry. The component concentration is determined by standard series analysis.

8) *Gas Chromatographic-Mass Spectrometric Analysis of a Complex Mixture.* A complex mixture of forty components is separated on a capillary column. The components are

identified by spectral comparisons with those in the mass spectral library. Unmatchable components are identified by analysis of their spectral fragmentation patterns.

A paper entitled "Analytical Chemistry for Engineers" (with J. O. Mullis and R. A. Braga) was presented at the 202nd National Meeting of the American Chemical Society, New York, NY, last August in the NSF-sponsored symposium in DIVCHED. Two of the laboratory experiments developed for this course (*Sampling of Heterogeneous Mixtures* and *Evaluation of the Efficiency of Extractions by Atomic Absorption Spectroscopy*) will be submitted for publication in the *Journal of Chemical Education.*

PART IV — FINAL PROJECT REPORT — SUMMARY DATA ON PROJECT PERSONNEL

(To be submitted to cognizant Program Officer upon completion of project)

The data requested below are important for the development of a statistical profile on the personnel supported by Federal grants. The information on this part is solicited in response to Public Law 99-383 and 42 USC 1885C. All information provided will be treated as confidential and will be safeguarded in accordance with the provisions of the Privacy Act of 1974. You should submit a single copy of this part with each final project report. However, submission of the requested information is not mandatory and is not a precondition of future award(s). Check the "Decline to Provide Information" box below if you do not wish to provide the information.

GRANT WAS FOR EQUIPMENT only.

Please enter the numbers of individuals supported under this grant.
Do not enter information for individuals working less than 40 hours in any calendar year.

	Senior Staff		Post-Doctorals		Graduate Students		Under-Graduates		Other Participants[1]	
	Male	Fem.	Male	Fem.	Male	Fem.	Male	Fem.	Male	Fem.
A. Total, U.S. Citizens	Not applicable									
B. Total, Permanent Residents	N/A									
U.S. Citizens or Permanent Residents[2]:										
American Indian or Alaskan Native ...										
Asian ...										
Black, Not of Hispanic Origin ...										
Hispanic ...										
Pacific Islander ...										
White, Not of Hispanic Origin ...										
C. Total, Other Non-U.S. Citizens	N/A									
Specify Country 1.										
2.										
3.										
D. Total, All participants (A + B + C)										
Disabled[3]										

☐ Decline to Provide Information: Check box if you do not wish to provide this information (you are still required to return this page along with Parts I-III).

[1]Category includes, for example, college and precollege teachers, conference and workshop participants.

[2]Use the category that best describes the ethnic/racial status for all U.S. Citizens and Non-citizens with Permanent Residency. *(If more than one category applies, use the one category that most closely reflects the person's recognition in the community.)*

[3]A person having a physical or mental impairment that substantially limits one or more major life activities; who has a record of such impairment; or who is regarded as having such impairment. *(Disabled individuals also should be counted under the appropriate ethnic/racial group unless they are classified as "Other Non-U.S. Citizens.")*

AMERICAN INDIAN OR ALASKAN NATIVE: A person having origins in any of the original peoples of North America, and who maintain cultural identification through tribal affiliation or community recognition.

ASIAN: A person having origins in any of the original peoples of East Asia, Southeast Asia and the Indian subcontinent. This area includes, for example, China, India, Indonesia, Japan, Korea and Vietnam.

BLACK, NOT OF HISPANIC ORIGIN: A person having origins in any of the black racial groups of Africa.

HISPANIC: A person of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin, regardless of race.

PACIFIC ISLANDER: A person having origins in any of the original peoples of Hawaii; the U.S. Pacific Territories of Guam, American Samoa, or the Northern Marianas; the U.S. Trust Territory of Palau; the islands of Micronesia or Melanesia; or the Philippines.

WHITE, NOT OF HISPANIC ORIGIN: A person having origins in any of the original peoples of Europe, North Africa, or the Middle East.

THIS PART WILL BE PHYSICALLY SEPARATED FROM THE FINAL PROJECT REPORT AND USED AS A COMPUTER SOURCE DOCUMENT. DO NOT DUPLICATE IT ON THE REVERSE OF ANY OTHER PART OF THE FINAL REPORT.